

# *Emergent literacy skills of Saudi Arabic speaking children with and without developmental language disorder*

Article

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1 **Emergent literacy skills of Saudi Arabic speaking children with and**  
2 **without developmental language disorders**

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26 **Emergent literacy skills of Saudi Arabic speaking children with and**  
27 **without developmental language disorder**

28 **ABSTRACT**

29 Research with English-speaking populations has shown that there is a relationship  
30 between developmental language disorder (DLD) and emergent literacy skills in  
31 children. A small number of Arabic studies have indirectly investigated this relationship  
32 in typically developing (TD) children, and children with reading difficulties, and  
33 demonstrated the important role of morphosyntactic skills in Arabic reading acquisition.  
34 However, none of the previous work has examined the relationship between oral  
35 language and emergent literacy skills in children with and without DLD. The aims of  
36 this study are twofold: to investigate the language and emergent literacy skills of Saudi  
37 Arabic children with DLD aged between 4;0 – 6;11 years of age; to compare their  
38 performance to age and socioeconomic status matched TD children, and to investigate  
39 the relationship between language and emergent literacy skills in both groups. A  
40 comprehensive Arabic language and emergent literacy battery was administered.  
41 Findings demonstrated that the TD group significantly outperformed the DLD group on  
42 most emergent literacy tasks. The DLD group was significantly less accurate than TD  
43 group on syllable segmentation, and phoneme awareness skills. There were significant  
44 associations between oral language skills and emergent literacy skills in the DLD group.  
45 In TD group, vocabulary knowledge and syntactic skills were associated with some  
46 emergent literacy skills. Syntactic skills were found to have moderately significant  
47 relationship with all emergent literacy skills in both groups. This might suggest the  
48 important role of morphosyntactic skills to literacy development in Arabic. Overall,  
49 findings were consistent with existing literature, and demonstrated strong relationships  
50 between oral language and emergent literacy skills in the Arabic language.

51 Keywords: Developmental language disorder, phonological awareness, emergent  
52 literacy, language skills, Arabic

53 **Introduction**

54 The ability to read fluently and accurately is a crucial skill for academic success (Catts  
55 et al., 2002; Gough & Tunmer, 1986). Learning to read is a gradual process and starts to  
56 develop before formal reading exposure and prior to formal schooling. The concept of  
57 *emergent literacy* was initially proposed by Marie Clay (1966) and reflects children's  
58 knowledge and ability to understand reading and writing before they are considered  
59 readers and writers (Tael & Sulzby, 1986). Emergent literacy skills, which include  
60 phonological awareness, alphabet knowledge and print awareness, are acquired through  
61 an interactive and continuous process with oral language skills.

62 According to Whitehurst and Lonigan (1998), emergent literacy includes two  
63 distinct but interrelated domains: outside-in domain, which refers to oral language skills  
64 (e.g., print concept, vocabulary, grammar, narrative) and inside-out domain, which refers  
65 to decoding-related skills (e.g., phonological awareness, letter knowledge, name writing).  
66 According to the simple view of reading (SVR), children must use both word-level cues  
67 (i.e., decoding) and sentence level cues (i.e., during the comprehension process) to be  
68 successful readers (Gough & Tunmer, 1986). Scarborough (2001) supported the SVR  
69 model and proposed the reading rope model which defined the important subskills  
70 involved in the reading process domains (i.e., language comprehension & word  
71 recognition). Thus oral language plays an important role in emergent literacy  
72 development as oral language skills are the foundation of literacy acquisition (Nagy et  
73 al., 2014; Scarborough, 2009; Snow, 2020; Storch & Whitehurst, 2002). Children who  
74 are impaired with their language development may be at risk of having impaired emergent  
75 literacy and later literacy skills.

76           Developmental language disorder (DLD)<sup>1</sup> affects approximately 7.58% of  
77 children (Norbury et al., 2016) and is characterized by language difficulties with no  
78 known differentiating conditions (e.g., Autism spectrum disorder, cerebral palsy, brain  
79 injury, sensorineural hearing loss) (Bishop et al., 2016, 2017). Since reading is a linguistic  
80 based skill, children with DLD are at particular risk of having difficulties with emergent  
81 literacy and subsequently later literacy difficulties (Snowling et al., 2016, 2019;  
82 Tambyraja et al., 2015). The relationship between oral language deficits and emergent  
83 literacy and subsequent literacy acquisition has been well documented, however, there  
84 has been limited research in Arabic. This study aims to provide an initial investigation of  
85 emergent literacy skills in Saudi Arabic speaking children with and without DLD.

86           A large body of research, mainly focusing on English-speaking populations, has  
87 shown that oral language skills are linked to literacy skills in both typically developing  
88 (TD) children and in children with DLD. Storch and Whitehurst (2002), in a  
89 longitudinal study which followed 626 TD children from preschool up to 4<sup>th</sup> grade  
90 reported a strong positive correlation between decoding-related skills (i.e., print  
91 concept, phonological awareness, and emergent writing) and oral language skills (i.e.,  
92 receptive and expressive vocabulary, narrative skills, basic concepts, and word  
93 structure) during the preschool period. They also found that the strength of this  
94 relationship changed over time. Oral language skills were significantly related to  
95 decoding-related/emergent literacy skills during the preschool period. Significant  
96 relationships between language (i.e., phonological skills, grammar, and vocabulary  
97 knowledge) and reading skills (both decoding and reading comprehension) were  
98 reported by Mutler et al., (2004). Phonological awareness skills (e.g., rhyme detection

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<sup>1</sup> DLD- used throughout the paper, as a result of a consensus reached (see Bishop, D. V., Snowling, M. J., Thompson, P. A., Greenhalgh, T., & Catalise Consortium. (2016). CATALISE: A multinational and multidisciplinary Delphi consensus study. Identifying language impairments in children. *PLOS one*, 11(7), e0158753.)

99 and production, initial and final phoneme deletion etc) which are part of emergent  
100 literacy skills, were strong predictors of word recognition skills, whereas vocabulary  
101 knowledge and grammatical skills were strong predictors of reading comprehension.

102 Language difficulties has been related to delayed emergent literacy skills in  
103 children with DLD. Boudreau and Hedberg (1999) reported that children with DLD  
104 aged 5;2 years old performed at a significantly lower level on emergent literacy skills  
105 such as rhyme, letter names and print concepts compared to age and socioeconomic  
106 matched TD children. Similarly, a longitudinal study by Catts et al. (2002) of 570  
107 children with DLD (aged 5;10 – 6;0) found they were at high risk of developing reading  
108 difficulties in second and fourth grades in school. The children with more severe  
109 language impairments had lower reading outcomes. Recently, Snowling et al., (2016,  
110 2019) found that children with DLD performed significantly lower than the TD group  
111 on all literacy measures. These findings have been replicated in other languages such as:  
112 Spanish (Pratt, 2017; Pratt et al., 2020), Italian (Brizzolara et al., 2011), Chinese (Wong  
113 et al., 2010), Czech (Moll et al., 2016), and Portuguese (Oliveira et al., 2021).

114 Studies in the Arabic language have mainly focused on investigating the  
115 importance of phonological awareness, and its relationship to literacy in school-aged  
116 children (Abu-Rabia, 2007; Al-Sulaim, 2014; Asaad & Eviatar, 2014; Elbeheri &  
117 Everatt, 2007; Mannai & Everatt, 2005; Saiegh-Haddad & Haj, 2018; Schiff & Saiegh-  
118 Haddad, 2018; Taibah & Haynes, 2011). Few studies have included children with reading  
119 difficulties or language deficits (Abu-Rabia, 2007; Abu-Rabia et al., 2003; Elbeheri &  
120 Everatt, 2007). Abu-Rabia et al., (2003) compared school-aged children's performance  
121 on reading and cognitive processing skills (i.e., syntax, phonological awareness,  
122 morphology, working memory, and visual processing) and found that children with  
123 reading difficulties performed significantly lower, specifically in syntax and morphology,

124 than age and socioeconomic matched TD children.

125 Abu Ahmad et al. (2014) investigated the cognitive predictors of early reading  
126 acquisition. They assessed 194 Arabic speaking children twice - once at the end of  
127 kindergarten level (mean age = 5;9 years old, SD = 3.6 months), and again at the  
128 beginning of the 2<sup>nd</sup> grade level - and compared the effects of decoding-related skills (i.e.,  
129 phoneme awareness, phonological processing, orthographic processing, print concept,  
130 and morphological awareness) and oral language skills (i.e., general nonverbal ability,  
131 receptive vocabulary, syntactic awareness, and working memory) on word reading. They  
132 concluded that decoding-related skills were stronger predictors of word recognition in  
133 Arabic than oral language skills. Decoding-related skills predicted 33% of the variance  
134 in word recognition while oral language skills predicted 11% of the variance in word  
135 recognition. They also found that morphological awareness skills, which explained 17%  
136 of the variance, are an important contributor to word recognition. This finding is in line  
137 with other Arabic studies (Abu-Rabia, 2007; Asadi et al., 2017), which point to the  
138 important role of morphology in reading development in Arabic.

139 Despite the available literature in Arabic, no studies have examined the  
140 relationship between emergent literacy and oral language skills in children with and  
141 without DLD. Most of the studies have focused on school-aged children so our knowledge  
142 about the emergent literacy skills in younger children is limited. Also, available studies  
143 have not considered a broad range of linguistic skills (e.g., semantic, morphosyntax, and  
144 comprehension) and emergent literacy skills (e.g., phonological awareness, letter  
145 knowledge, and decoding). As a result, the nature of the relationship between language  
146 and emergent literacy young Arabic-speaking children is still unclear.

147 It is possible that the relationship between oral language skills and emergent  
148 literacy may vary between languages, and given the phonological and orthographic



149 differences between English and Arabic, the relationship between language deficits and  
150 emergent literacy skills in Arabic may be different from English. Therefore, studies on  
151 the relationship between language and emergent literacy in Arabic are crucial to advance  
152 our knowledge on the foundational role that language plays in literacy development and  
153 to inform early intervention.

154 ***Present study***

155 The aims of the present study are: (1) to investigate the emergent literacy skills of Saudi  
156 Arabic speaking children with and without DLD, aged between 4;0 and 6;11 years old  
157 (reflecting the age when many children are diagnosed with DLD and also when children  
158 transition to school), and (2) to explore the relationship between different language  
159 domains (i.e., semantics, morphology, syntax, and comprehension) and different  
160 emergent literacy skills which include phonological awareness skills (syllable  
161 segmentation, and phonemic awareness), letter knowledge and decoding. The research  
162 questions are:

- 163 (1) Do Saudi Arabic speaking children with DLD aged 4;0-6;11 differ from  
164 typically developing peers on emergent literacy skills?  
165 (2) What is the relationship between language and emergent literacy skills in  
166 Saudi Arabic speaking children with and without DLD?

167 Based on the existing literature, we predict that, compared to TD children,  
168 children with DLD will demonstrate lower overall accuracy on emergent literacy tests.  
169 Since previous research has found a relationship between language and emergent literacy  
170 skills in TD and DLD children, we expect that oral language skills will be related to  
171 emergent literacy skills in both TD and DLD groups.

172 **Method**

173 Permission to conduct the testing was obtained from the Higher Ministry of Education in  
174 Riyadh, Saudi Arabia. Ethical approval was granted by the School of Psychology and  
175 Clinical Language Sciences Research Ethics Committee, University of Reading (approval  
176 no. 2019-050-VS).

177

178 ***Participants***

179 Sixty-four Saudi children were recruited for the study. The participants included 40 TD  
180 children (20 boys, 20 girls; 4;0 – 6;11), and 24 children with DLD (16 boys, 8 girls; 4;0  
181 – 6;11). All participants were monolingual Arabic speakers and matched for their age and  
182 socioeconomic status. In order to control for socioeconomic status, parents completed a  
183 demographic questionnaire including parental educational level, parental occupation, and  
184 family income. The groups did not differ significantly on gender  $\chi^2(1, N = 64) = 1.69$ ,  
185  $p = .193$ , family income:  $\chi^2(4, N = 61) = .58$ ,  $p = .965$ , paternal educational level:  $\chi^2$   
186  $(2, N = 64) = 4.46$ ,  $p = .107$  and maternal educational level  $\chi^2(2, N = 64) = 2.44$ ,  $p =$   
187  $.295$ .

188 The TD children (mean age= 65.45 months,  $SD = 9.37$  months) were recruited from  
189 four public kindergartens and reported by their parents and teachers to be developing  
190 language typically. Inclusionary criteria for this group were: (1) age-appropriate language  
191 skills as reported by their parents, (2) no hearing impairment, (3) no history of speech,  
192 language or communication disorder, and (4) no other neurological, social, emotional,  
193 behavioural, emotional or sensory disorders.

194 The children with DLD (mean age = 62.96 months,  $SD = 11.18$  months) were  
195 recruited from a speech and language clinic at King Abdulaziz University Hospital in  
196 Riyadh. Children were diagnosed with DLD by a qualified speech-language therapist  
197 (SLT) and had been receiving speech and language therapy. Since standardized Arabic  
198 language assessments are not available, it was crucial to ensure that children with DLD

199 met Bishop et al's (2016, 2017) criteria for DLD. Inclusionary criteria for this group were  
200 (1) a diagnosis of developmental language disorder, and (2) no known differentiating  
201 condition (e.g., brain injury, cerebral palsy, sensorineural hearing loss, autism, and other  
202 genetic conditions). This was confirmed by administering the Arabic language battery  
203 (see Table 3) which shows that the DLD group scored significantly lower than the TD  
204 group. All parents of potential participants were asked to sign consent forms and fill  
205 demographic and developmental history questionnaires.

206 See Table 1 for demographic information for both groups of participants.

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**Table 1.** *Participants' demographic characteristics*

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	<b>Group</b>	
	<i>TD</i> <i>n = 40</i>	<i>DLD</i> <i>n = 24</i>
<b>Family characteristics</b>	<b>%(n)</b>	
<b>Father's education</b>		
<i>High school &amp; Diploma</i>	20(8)	37.5 (9)
<i>University degree/college diploma</i>	40(16)	45.8(11)
<i>Postgraduate degree</i>	40(16)	16.7(4)
<b>Mother's education</b>		
<i>High school &amp; Diploma</i>	10(4)	33.3(8)
<i>University degree/college diploma</i>	12.5(5)	58.3(14)
<i>Postgraduate degree</i>	55(22)	8.3(2)
<b>Literacy home exposure</b>	<b>%(n)</b>	
<b>Book Exposure</b>	75(30)	70.8(17)
<b>Shared book activity</b>		
<i>Always</i>	7.7(3)	12.5(3)
<i>Sometimes</i>	53.8(21)	45.8(11)
<i>Rarely</i>	33.3(13)	3.3(8)
<i>Never</i>	5(2)	8.3(2)

**Note.** **TD:** Typically Developing, **DLD:** Developmental Language Disorder.

\*  $p < .05$ , \*\*  $p < .01$

226

227 **Materials**

228 To assess the relationship between oral language skills and emergent literacy skills, a

229 comprehensive Arabic language and emergent literacy test battery was administered.

230 Table 2 provides a summary of these assessments. Due to the lack of standardized Arabic

231 assessments, all measures were developed and designed by the first author. Picture  
 232 stimuli, words, and sentences were adapted from previous studies (Najmaldeen, 2020;  
 233 Shaalan, 2010; Wallan, 2018). To evaluate the feasibility and the appropriateness of the  
 234 adapted measures, all measures were piloted with 10 TD children aged between 48 and  
 235 72 months, with a mean age of 64 months ( $SD = 9.35$ ). Results indicated that measures  
 236 were age appropriate and age sensitive. Each assessment is described below.

237 **Table 2.** *Arabic Language Battery and Arabic Emergent Literacy Battery*

<b>Arabic Language Battery</b>		<b>Arabic Emergent Literacy Battery</b>	
<i>Receptive Language Skills</i>		<i>Phonological Awareness</i>	
(1) Vocabulary Knowledge	Receptive	(1) Syllable Segmentation	
	Expressive		
(2) Oral Comprehension	Literal	<i>Phoneme Awareness</i>	
	Inferential	(2) Phoneme Isolation	Initial
<i>Expressive Language Skills</i>			Final
(3) Sentence Repetition	Target Syntax	(3) Phoneme Deletion	Initial
			Final
(4) Language Sample	MPU	<i>Letter Knowledge</i>	
<i>Phonological Processing skills</i>		(4) Letter Name	
(5) Non-word Repetition		(5) Letter Sound	Isolation
			Initial
			Medial
			Final
(6) Digit Recall		<i>Decoding</i>	
		(1) Single word reading	

**Note.** MPU: Mean length per utterance

238  
 239 *Arabic Language Battery*  
 240 In 2010, the National Early Literacy Panel metanalysis' study noted that explicit oral  
 241 language assessments (i.e., which address a broad range of linguistic skills) were more  
 242 sensitive for defining the linguistic precursors for later literacy skills (Shanahan &  
 243 Lonigan, 2010). Thus, a comprehensive language battery was administered to evaluate  
 244 different receptive and expressive language skills. The following tests were included:

245 **Arabic Picture Vocabulary Test (APVT) (Shaalán, 2010).** The Arabic Picture  
246 Vocabulary Test (Shaalán, 2010) was standardized on Qatari children aged between 4;6  
247 – 9;4 years old. The test includes 132 age- appropriate stimuli that increase in complexity  
248 and are divided into 10 different groups with 12 stimuli in each group. For the purposes  
249 of our study, the APVT test was modified to make it age and culturally appropriate for  
250 the participants. An adapted shorter version was used to evaluate children’s receptive  
251 vocabulary knowledge. The test included 96 stimuli which ranged in difficulty and were  
252 divided into 8 different groups with 12 items per group. Stimuli were chosen from the  
253 following categories: verbs, nouns, adjectives, animals, and professions. Due to dialectal  
254 differences, some stimuli were substituted with common Saudi dialect words. For  
255 example, the Qatari dialect word /muḡam:a/ which means ‘broom’ in English, was  
256 substituted by the Saudi dialect word: /muknisa/. The test was administered digitally  
257 using PowerPoint to improve child’s engagement. Each slide consisted of 4 coloured  
258 pictures (obtained from Shutterstock.com). Children were required to point to the picture  
259 that they thought was correct. Every correct response was scored as 1, and every incorrect  
260 response was scored as 0.

261 ***Listening Comprehension Test.*** The Squirrel Story Narrative Comprehension  
262 Assessment (NCA) (Dawes, 2017) was used to assess children’s listening  
263 comprehension skills by asking literal and inferential questions. Since the story was  
264 found to be culturally and age-appropriate, it was translated into Arabic. The story  
265 includes clear and simple story structure, emotions that can be inferred, and age  
266 appropriate vocabulary. The task includes 13 literal and inferential questions providing  
267 information about children’s ability to orally comprehend narratives. The application  
268 version was used, and the NCA protocol and scoring scale was followed (Dawes, 2017).  
269 Children were required to watch and listen to the story on an iPad whilst the first author  
270 told the story. Children were then asked to answer comprehension questions while  
271 looking through the story pictures. The NCA scoring scale ranged from 0 – 2 points for  
272 each question.

273 ***Arabic Expressive Vocabulary Test-2 (AEVT-2).*** The Arabic Expressive Vocabulary  
274 test was developed to assess children’s expressive vocabulary knowledge. Stimuli were  
275 selected based on item categories and difficulty. Stimuli were chosen to include verbs,  
276 adjectives, singular and plural nouns from different groups such as: animals, toys,  
277 objects, places and professions. A familiarity rating scale was collected from 10 adult  
278 Arabic speaking. Each word received a rating from 1 – 4 (1 = totally unfamiliar word  
279 and 4 = totally familiar word). Based on the familiarity rating scale and the author’s  
280 clinical experience, the 85 stimuli were ranked from most familiar to least familiar. The  
281 test was administered digitally using PowerPoint. Each slide consisted of one coloured  
282 picture (obtained from Shutterstock.com). Children were asked to name the presented  
283 picture. Synonyms were counted as correct responses. Every correct response was  
284 scored as 1, and every incorrect response was scored as 0.

285 **Arabic Sentence Imitation Task (ASIT).** The Arabic Sentence Imitation Task (ASIT)  
286 was developed to assess children’s ability to use morpho-syntactic structure and lexical  
287 skills during their communication. Following the LITMUS-S Rep’s principles (Marinis  
288 & Armon-lotem, 2016), the ASIT task included different syntactically complex  
289 structures that have been found to be difficult for Arabic speaking children diagnosed  
290 with DLD (e.g., present tense, passive sentences, object questions, subject and object  
291 relatives sentences, and accusative pronouns). The task consisted of 37 sentences  
292 presented in a randomized order. Children were asked to listen carefully and repeat the  
293 heard sentence verbatim. Children’s productions were scored using the target syntactic  
294 structure’s scoring method (i.e., 1 = if the child used the target syntactic structure, 0 = if  
295 the child made an error or omitted using the target syntactic structure).

296 **Spontaneous Language Sample.** A language sample was used to provide a more  
297 naturalistic assessment of expressive language and as a tool for further language  
298 analysis (i.e., number of different words, mean length of utterance, and narrative skills).  
299 Spontaneous language samples were obtained using the wordless picture book “Frog,  
300 Where Are You?” (Mayer, 1969). This book was chosen because it has been used  
301 across different languages and cultures. Each child generated a story, “Frog, Where Are  
302 You?” while describing the presented pictures. Children’s utterances were analyzed to  
303 calculate the mean morpheme per utterance (MPU). We followed Shaalan and Khater's  
304 (2006) guidelines of counting Arabic morphemes which were adapted from Dromi and  
305 Berman (1982).

306 **Arabic Emergent Literacy Battery**



307 ***Phonological Awareness Tests.*** Different phonological awareness tests were developed  
308 to evaluate children’s meta-phonological skills. Analytic phonological awareness tests  
309 (i.e., deleting, counting, and manipulating) are the strongest predictors of decoding and  
310 reading comprehension (Shanahan & Lonigan, 2010). Thus, different analytic  
311 phonological awareness tests were administered and included different linguistic unit  
312 sizes (i.e., syllable level to phoneme level). The following tests were included:

313 *Syllable Segmentation Test.* A syllable segmentation test was developed to  
314 evaluate children’s ability to detect the number of syllables in words. The test  
315 comprised three practice stimuli and 10 test stimuli ranging from one to five syllables in  
316 length (i.e., two stimuli for every syllable length). The order of the stimuli was  
317 randomized. Children were asked to listen to the word, and segment it into syllables. To  
318 simplify the task, five different tokens were presented, and children were asked to point  
319 to the tokens or clap while they orally segmented the words into syllables. Saying the  
320 words while segmenting its syllables considered a correct response, for example,  
321 segmenting the Arabic word /ʔis<sup>ʕ</sup>baʕ/ (which means ‘finger’) into two syllables and  
322 saying /ʔis<sup>ʕ</sup>-baʕ/. Correct oral responses were scored as 1, incorrect oral responses were  
323 scored as 0.

324 *Phoneme Awareness Tests.* Phoneme awareness skills were assessed using  
325 phoneme isolation (initial, final), and phoneme deletion (initial, final) tasks. The  
326 phoneme isolation sub-test aimed to assess children’s ability to identify a sound in a  
327 word and isolate this sound. For the initial phoneme isolation sub-test, children were  
328 asked to listen to the words and then isolate the initial phoneme of the word. For  
329 example, “What is the first sound in the word /ʃaru:f/ (i.e., sheep in English)?” (answer:  
330 /ʃ/). For the final phoneme isolation subtest, children were asked to listen to word and  
331 isolate the final phoneme of the word. For example, “What is the last sound in the word  
332 /hali:b/ (i.e., milk in English) ?” (answer /b/). The phoneme isolation sub-test consisted  
333 of three practice stimuli and 12 test stimuli ranging from one to three syllables in length.  
334 Correct responses were scored as 1, incorrect responses were scored as 0.

335 Phoneme deletion is considered to be more difficult than phoneme isolation as it  
336 requires a higher level of phonemic awareness. The phoneme deletion sub-test aimed to  
337 assess the child’s ability to identify the target sound, delete the sound from the word,  
338 and then identify the new word. For the initial phoneme deletion sub-test, children were  
339 required to listen to the word, and then say the word without the initial phoneme, for  
340 example, say /na:r/ (i.e., fire in English) without /n/; the answer is: /a:r/. For the final  
341 phoneme deletion sub-test, children were required to listen to the word, and then say the  
342 word without the final phoneme. For example, say /bint/ (i.e., girl in English) without  
343 /t/; the answer is /bin/. This sub-test included 3 practice stimuli, and 12 test stimuli of  
344 one and two syllables in length. Correct responses were scored as 1, incorrect responses  
345 were scored as 0.

346 **Letter Knowledge.** Letter knowledge is the beginning of orthographic knowledge, and  
347 one of the higher levels of the emergent literacy skills. As children get more  
348 experienced with letters, they become more aware of the words' components: syllables  
349 and phonemes (Rhyner, 2009). Arabic orthography includes 28 letters. All of them are  
350 consonants except for the letter *ʾ* /a/ which acts as a carrier for the glottal phoneme /ʔ/  
351 (i.e. *أ, ؤ*) (Saiegh-haddad & Henkin-Roitfarb, 2014). One factor that may influence the  
352 acquisition of Arabic reading is the variability of the Arabic graphemes' shapes in the  
353 written scripts (Asaad & Eviatar, 2013). Thus, three different tasks were used to  
354 evaluate children's letter knowledge: letter naming, grapheme-phoneme correspondence  
355 in isolation, and grapheme-phoneme correspondence in all positions to assess children's  
356 knowledge of all letter shapes. All letters were presented on white cards, and children  
357 were required to name them (in the letter naming task), and sound them out (in the  
358 grapheme-phoneme correspondence tasks). Correct responses were scored as 1,  
359 incorrect responses were scored as 0.

360 **Decoding.** Decoding words is one of the highest levels of emergent literacy skills. To  
361 read a single word, children must segment the word into phonemes, translate the  
362 phonemes into sounds, and blend the phonemes again. Thus, decoding requires  
363 sophisticated and explicit linguistic and cognitive processing skills. For the purpose of  
364 this study, a single word reading test was administered. The test included 20 simple  
365 single words presented on white cards. Every word contained three letters. For example:  
366 the word /ʃams/ (شمس) in Arabic which means 'sun' in English. Children were required  
367 to read the words. Correct responses were scored as 1, incorrect responses were scored  
368 as 0.

369 *Additional tests*

370 ***Nonverbal Reasoning Test.*** To assess the children’s nonverbal reasoning abilities, the  
371 Raven’s Coloured Progressive Matrices (CPM) (Raven, 1998) was administered.

372 ***Nonword Repetition Test.*** Shaalan’s (2010) Nonword Repetition test was administered  
373 to assess: phonological short-term memory, phonological processing, auditory  
374 processing skills, and speech-motor processing skills. The test included 30 nonword  
375 stimuli which were presented in a randomized order. Children were required to carefully  
376 listen to the nonwords and repeat them verbatim. Correct responses were scored as 1,  
377 incorrect responses were scored as 0.

378 ***Digit Recall Test.*** A Digit Recall test was administered to evaluate children’s verbal  
379 memory abilities. The Digit Recall subtest from the Clinical Evaluation of Language  
380 Fundamentals- Fourth Edition (CELF-4) (Semel et al., 2006) (Semel, Wiig, & Secord,  
381 2006) was adapted for Arabic. The subtest consists of digits ranging from one to nine.  
382 Children were asked to repeat back a series of numbers in the same order they have  
383 heard them. Correct responses were scored as 1, incorrect responses were scored 0.

384 ***Procedure***

385 Children were assessed individually in a quiet area of their nursery setting, school, or  
386 speech and language therapy clinic. The number of the sessions varied between two to  
387 three sessions depending on the participants’ age, and motivation; younger children  
388 (i.e., 4;0 – 4;11 years old) required three sessions because of their lower attention span.  
389 Each session lasted approximately 1 hour and children were given as many breaks as  
390 needed. All participants were required to complete the general tests, the Arabic  
391 language battery, and the Arabic emergent literacy battery. Typically developing  
392 children were also required to complete the hearing screening in order to rule out any  
393 hearing deficits. Since DLD children already had their hearing screening prior to their  
394 diagnosis, they did not complete a hearing screening during testing. All tests were

395 administered by the first author, a qualified speech and language therapist, and audio-  
396 recorded using Sony ICD-UX560F digital voice recorder. In order to engage participants  
397 during testing, each child was provided with a token board to complete using print  
398 stamps as a reinforcement. Once the child completed the board (i.e., when all tests were  
399 administered), a big sticker was provided.

#### 400 ***Reliability***

401 Interrater reliability was established by having a second qualified Saudi Arabic-  
402 speaking speech and language therapist who independently scored the responses of 15  
403 children (23% of the sample). For the language assessments, the agreement between the  
404 two raters were high, with 100% agreement for receptive vocabulary, and 86.7%  
405 agreement for expressive vocabulary, listening comprehension, sentence repetition, and  
406 MPU. For the emergent literacy assessment, the agreement between the raters were  
407 100% agreement for syllable segmentation, phoneme awareness, letter knowledge, and  
408 decoding. Agreement between the raters was 86.7% for nonword repetition and 100%  
409 for digit recall.

#### 410 ***Analysis***

411 All statistical analyses were performed using IBM SPSS Statistics, version 27. Raw  
412 scores were converted to percentages, and composite scores of vocabulary knowledge  
413 (i.e., receptive and expressive vocabulary tests), listening comprehension (i.e.,  
414 inferential and literal questions), phoneme awareness (i.e., phoneme isolation and  
415 deletion tests), and letter knowledge (i.e., letter naming and letter sound tests) were  
416 obtained. Shapiro-Wilk's test was used to test the normality of the distributions. Results  
417 revealed non-normal distribution of data ( $p < .05$ ), and therefore, nonparametric tests  
418 were used. Mann Whitney U tests were used to investigate the differences in  
419 performance between groups on all emergent literacy tasks, and effect sizes were

420 calculated by dividing the Z score by the square-root of the total sample size. A p-value  
421 cut-off of 0.0125 was adopted and corrected for multiple comparisons using the  
422 Bonferroni approach as suggested by Field (2013). Further, Spearman rank order  
423 correlation coefficient controlling for age was carried out to examine the relationship  
424 between oral language skills and emergent literacy skills in TD and DLD groups.  
425 Significance levels were set at  $p < .05$ .

## 426 **Results**

### 427 *Between group comparison*

428 The first research question was to compare emergent literacy performance skills of the  
429 TD and DLD groups. Descriptive data for each group is presented in Table 3, and the  
430 differences in performance across groups in emergent literacy tests are presented in  
431 Figure 1.

432 **Table 3.** Language, emergent literacy, and additional baseline assessments for TD and  
433 DLD groups (raw and percentage correct % score)



Measures	TD n = 40				DLD n = 24			
	Raw Scores		Percentage Correct %		Raw Scores		Percentage Correct%	
	Mean (SD) Range	Median	Mean (SD) Range	Median	Mean (SD) Range	Median	Mean (SD) Range	Median
<i>Language Assessments</i>								
Vocabulary Knowledge**	<b>135.88 (17.04)</b> 95 - 174	<b>137.50</b>	<b>75.10 (9.29)</b> 53 - 96	<b>76</b>	<b>113.33 (32.27)</b> 50 - 164	<b>114.50</b>	<b>62.71 (17.83)</b> 28 - 91	<b>63.50</b>
Syntactic Skills**	<b>29.70 (6.01)</b> 13 - 37	<b>31</b>	<b>80.33 (16.23)</b> 35 - 100	<b>84</b>	<b>12.83 (10.27)</b> 0 - 35	<b>11.50</b>	<b>34.67 (27.75)</b> 0 - 95	<b>31</b>
Listening Comprehension**	<b>16.25 (5.33)</b> 8 - 31	<b>16</b>	<b>47.60 (13.67)</b> 24 - 84	<b>48</b>	<b>7.54 (5.13)</b> 0 - 16	<b>8</b>	<b>22.92 (15.91)</b> 0 - 49	<b>24</b>
MPU**	<b>6.42 (1.89)</b> 4.10 - 13	<b>6</b>	- -	-	<b>4.78 (2.08)</b> 1.20 - 10.70	<b>4.80</b>	- -	-
<i>Emergent Literacy Assessments</i>								
Syllable Segmentation**	<b>5.08 (2.45)</b> 0 - 9	<b>5</b>	<b>50.85 (24.37)</b> 0 - 90	<b>50</b>	<b>2.13 (2.49)</b> 0 - 7	<b>1.50</b>	<b>21.25 (24.90)</b> 0 - 70	<b>15</b>
Phoneme Awareness**	<b>4.06 (3.37)</b> 0 - 11	<b>3.63</b>	<b>34.10 (28.06)</b> 0 - 90	<b>30</b>	<b>1.58 (3.12)</b> 0 - 11	<b>.00</b>	<b>13.38 (26.13)</b> 0 - 92	<b>.00</b>
Letter Knowledge	15.28 (15.30) 0 - 44	7.50	35.75 (33.56) 0 - 98	19.50	11.83 (16.45) 0 - 45	3	27.67 (35.93) 0 - 100	9
Decoding	2.90 (5.63) 0 - 19	.00	14.50 (28.17) 0 - 95	.00	1.71 (5.64) 0 - 20	.00	8.54 (28.19) 0 - 100	.00
<i>Additional Assessments</i>								
Nonverbal Reasoning	13.18 (4.47) 6 - 28	13	36.67 (12.37) 17 - 78	36	11.29 (5.59) 1 - 21	11	31.38 (15.52) 3 - 58	31
Nonword Repetition**	<b>26.18 (3.46)</b> 16 - 30	<b>27</b>	<b>87.25 (11.58)</b> 53 - 100	<b>90</b>	<b>10.75 (7.00)</b> 0 - 30	<b>9</b>	<b>35.83 (23.34)</b> 0 - 100	<b>30</b>
Digit Recall**	<b>5 (1.39)</b> 3 - 8	<b>5</b>	<b>31.33 (8.78)</b> 19 - 50	<b>31</b>	<b>3.08 (1.64)</b> 0 - 7	<b>3</b>	<b>19.29 (10.21)</b> 0 - 44	<b>16</b>

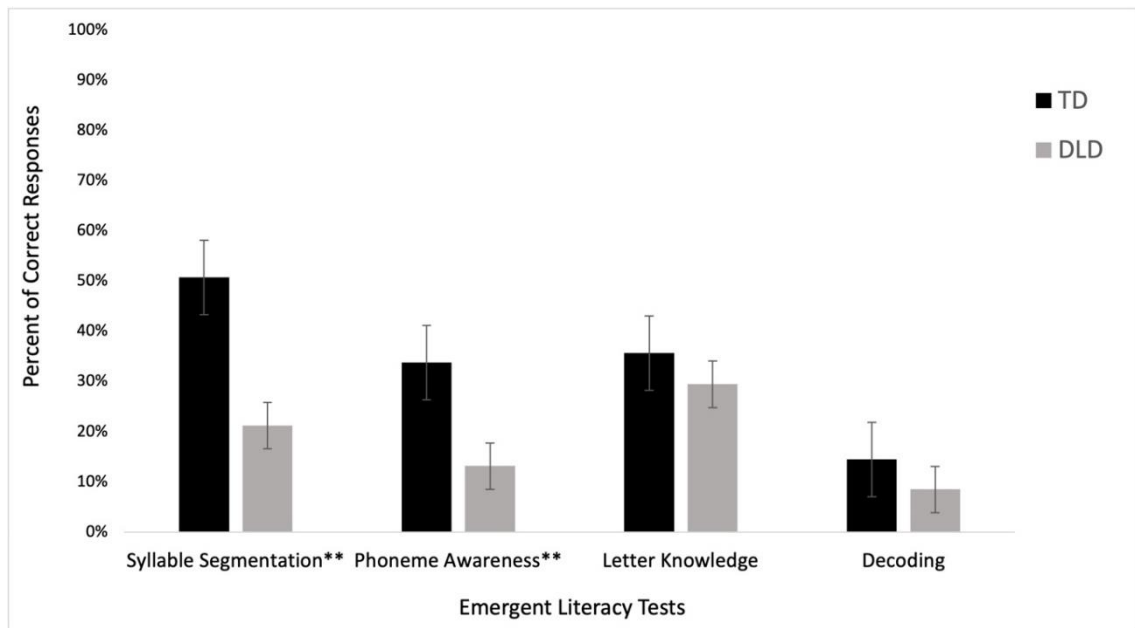


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**Note. TD:** Typically developing, **DLD:** Developmental language disorder, **SD:** Standard deviation, **MPU:** Mean length of utterance.

\* $p < .05$ , \*\* $p < .001$

435



436

437 **Figure 1.** Mean scores in emergent literacy tests in Typically developing (TD) children  
 438 and children with Developmental Language Disorder (DLD) \*\* $p < .001$

439

440 To further investigate this hypothesis, the Mann Whitney U test was conducted to  
 441 compare the means of the two groups' performances on all emergent literacy measures.  
 442 Findings revealed significant differences between the groups on: Syllable Segmentation  
 443 ( $U = 198.5, z = -3.95, p < .001$ ), and Phoneme Awareness ( $U = 249.5, z = -3.29, p <$   
 444  $.001$ ). However, although the mean scores of letter knowledge and decoding in TD  
 445 group were higher than the DLD group, these scores were not significantly different  
 446 between the two groups ( $U = 202, z = -3.87, p = .069$ ), ( $U = 414, z = -1.26, p = .206$ )  
 447 respectively. Overall, results indicated that typically developing children had  
 448 significantly higher scores on syllable segmentation, and phoneme awareness compared  
 449 to children with DLD.

450 ***Relationship between oral language skills and emergent literacy skills***

451 The second research question was to examine the relationship between oral language  
 452 and emergent literacy skills in the TD and DLD groups. We calculated Spearman rank

453 order correlation coefficients controlling for age within each group. These are shown in  
454 Table 4.

455

**Table 4.** Correlations between oral language and emergent literacy skills of TD and DLD groups (Spearman's rho)

456

	TD ( <i>n</i> = 40)				DLD ( <i>n</i> = 24)			
	SS	Phoneme A.	LK	Decoding	SS	Phoneme A.	LK	Decoding
Vocabulary Knowledge	.389*	.387*	.359*	.190	.587**	.675**	.732**	.386
Target Syntax	.355*	.390*	.534**	.357*	.661**	.653**	.683**	.529*
Listening Comprehension	-.018	.070	.051	-.168	.448*	.180	.476*	.045
MPU	.232	.258	.216	-.007	.682**	.643**	.580**	.461

*Note.* TD: Typically developing, DLD: Developmental language disorder, SS: Syllable segmentation, Phoneme A: Phoneme awareness, PA: Phonological awareness, LK: Letter knowledge, MPU: Mean length per utterances

\* $p < .05$ , \*\* $p < .001$

457

458 As Table 4 shows, results were different for the two groups. In the TD group,  
459 significant positive correlations were observed between vocabulary knowledge and  
460 syllable segmentation, phoneme awareness, and letter knowledge. Further, there were  
461 significantly positive correlations between syntactic skills and all emergent literacy  
462 skills. In the DLD group, all language tasks were significantly positively correlated with  
463 syllable segmentation, phoneme awareness, and letter knowledge. Syntactic skills were  
464 also significantly correlated with decoding skills.

## 465 **Discussion**

466 This present study aimed to explore emergent literacy skills of Saudi Arabic speaking  
467 children with and without DLD aged 4;00 to 6:11 and investigate the relationship  
468 between language and emergent literacy skills. The overall findings of this study are:  
469 (1) children with DLD performed significantly lower than their TD peers in most  
470 emergent literacy tests; (2) oral language skills were related to emergent literacy skills  
471 in both groups; (3) significant correlations between oral language and emergent literacy  
472 skills were stronger in the DLD group than TD group; (4) syntactic skills were found to  
473 be significantly correlated to all emergent literacy skills in both groups. These findings  
474 will be discussed below.

### 475 *Differences on measures of emergent literacy*

476 Our first research question focused on differences between TD and DLD groups on  
477 emergent literacy tasks. Based on previous research (Boudreau & Hedberg, 1999a; Catts  
478 et al., 2002; Snowling et al., 2019), we predicted that children with DLD would perform  
479 lower than their TD peers in all emergent literacy tasks. As predicted, there were  
480 significant differences between the groups in syllable segmentation and phoneme  
481 awareness. However, no significant between group differences were observed in letter  
482 knowledge and decoding. Lack of differences between the groups on letter knowledge

483 was surprising; however, the children with DLD were receiving speech and language  
484 therapy sessions before the start of the data collection period. During their speech and  
485 language therapy sessions, children may have been exposed to different letters which  
486 may explain their familiarity with some letters. Another reason could be that 5-year old  
487 children in both groups are still acquiring letter knowledge. With regard to decoding  
488 skills, a lack of differences between the groups could be explained by the fact that many  
489 children in both groups have not started school. This skill usually starts to develop  
490 around age 6 when children are exposed to formal literacy instructions. As a result, not  
491 all children in the TD group were able to decode.

492         The finding that children with DLD scored significantly lower than the TD  
493 children on syllable segmentation and phoneme awareness is in line with the existing  
494 literature across different languages, such as English (Boudreau & Hedberg, 1999b;  
495 Catts et al., 2002), Spanish (Pratt, 2017), Italian (Brizzolara et al., 2011), and Chinese  
496 (Wong et al., 2010). Language plays a significant role in literacy development (Snow,  
497 2020; Storch & Whitehurst, 2002). As a result, children must acquire strong linguistic  
498 and metalinguistic skills early during their development to competently decode and  
499 comprehend the written script (Gough & Tunmer, 1986; Scarborough, 2009). Thus, any  
500 deficits in any of the fundamental elements may interfere with the development of  
501 emergent literacy skills. Our findings provide additional support to the existing  
502 literature and demonstrate how language deficits may hinder the emergent literacy skills  
503 in Arabic speaking children.

#### 504 *Associations between oral language and emergent literacy skills*

505 The second research question focused on whether the oral language skills were related  
506 to emergent literacy skills in the TD and DLD groups. Results of the correlational  
507 analyses demonstrated the variables are related in different ways in each group. In the

508 TD group only vocabulary knowledge and syntactic skills were significantly correlated  
509 with emergent literacy skills (but listening comprehension or MPU were not correlated  
510 with emergent literacy skills). TD children are acquiring emergent literacy skills in a  
511 typically developing pattern, with strong general language skills. Storch and Whitehurst  
512 (2002) argued for the importance of the relationship between emergent literacy and oral  
513 language skills in the preschool years (i.e., 4; 0 – 4;11 years old) and how this  
514 relationship weakened once children got older. As children get older and enter school,  
515 print knowledge and phonological awareness contribute to their reading ability.

516 In the DLD group, correlational analyses showed that all oral language skills  
517 assessed in the study were significantly positively correlated with emergent literacy  
518 skills. Children with DLD are known to have difficulties in linguistic processing skills,  
519 and lag behind their TD peers in all language domains (Leonard, 2014). This means that  
520 they may be using all their linguistic resources during emergent literacy tasks, resulting  
521 in stronger relationships between all assessed oral language skills and emergent literacy  
522 measures.

523 When comparing the groups, vocabulary knowledge and syntactic skills were  
524 found to be significantly correlated with emergent literacy skills in both groups. These  
525 findings are in line with the well-documented evidence that vocabulary and  
526 morphosyntax play an important role in literacy acquisition (Catts et al., 2002; Muter et  
527 al., 2004; Snow, 2020; Storch & Whitehurst, 2002). Vocabulary and morphosyntax are  
528 foundational skills for both decoding and reading comprehension (Duff et al., 2015;  
529 Muter et al., 2004). While decoding, children must have competent vocabulary  
530 knowledge and understand the rules and the structure of their language to comprehend  
531 written language. Since most of the alphabetic languages are morphologically based,  
532 understanding the morphological rules of the language is crucial for decoding the

533 written script as well. With regard to the Arabic language, previous studies (Abu-Rabia,  
534 2007; Abu-Rabia et al., 2003) suggested that morphosyntax plays a significant role in  
535 Arabic literacy development which would suggest that it may also be related to  
536 emergent literacy. Our results support this, showing moderate positive correlations  
537 between MPU and most of the emergent literacy measures (e.g., syllable segmentation,  
538 phoneme awareness, and letter knowledge) in the DLD group.

539 Finally, moderate positive correlations were found between listening  
540 comprehension, syllable segmentation, and letter knowledge. One possible explanation  
541 for this could be similar underlying processing skills for both phonological awareness  
542 and listening comprehension skills. Both listening comprehension, and phonological  
543 awareness tap a broader range of linguistic skills (Catts & Kamhi, 2005). In listening  
544 comprehension, children must listen to the auditory input, analyse, and access their  
545 semantic and syntactic knowledge to comprehend the spoken output. Similarly,  
546 phonological awareness requires higher meta-linguistic skills.

547 To our knowledge, this is the first cross-sectional study that aimed to investigate  
548 the relationship between the oral language and emergent literacy skills in TD and DLD  
549 Saudi Arabic-speaking children aged between 4;0 and 6;11. Overall, our findings were  
550 in line with existing literature suggesting a strong relationship between oral language  
551 and emergent literacy skills in TD and DLD groups (Catts et al., 2002; Muter et al.,  
552 2004; Snow, 2020; Storch & Whitehurst, 2002). Specifically, children with DLD scored  
553 significantly lower on emergent literacy skills suggesting that their poorer oral language  
554 skills may impact negatively on the acquisition of emergent literacy skills. Further, our  
555 findings revealed that expressive syntactic skills have the most significant relationship  
556 with all emergent literacy in both groups. This highlights the potential importance of  
557 morphosyntactic structure for literacy development in the Arabic language.



558 ***Limitations***

559 Findings of this study should be interpreted with caution due to the following  
560 limitations. First, small sample sizes in both groups might have constrained our results.  
561 Future studies should recruit larger sample sizes to replicate the existing findings so  
562 more definitive conclusions can be drawn. Second, the gender imbalance in the DLD  
563 group was not controlled due to the limited sample size resulting in more boys than  
564 girls. This may reflect the reported bias in boys with DLD being more likely to receive  
565 clinical services (Morgan et al., 2017) despite a similar prevalence in boys and girls  
566 (Norbury et al., 2016) as the participants in the study were recruited from SLT  
567 caseloads. Third, the study uses a cross-sectional design. To have more accurate  
568 understanding of the relationship between oral language and emergent literacy skills,  
569 future studies should include longitudinal designs and investigate this relationship  
570 across different time points. Also, it should be noted that multiple correlations were  
571 carried out, such that, by chance, 1 in 20 may be significant due to chance. Finally, most  
572 of the administered tasks were not standardized on Saudi Arabic-speaking children.  
573 Further validation of these tasks is required for research and clinical purposes.

574 ***Clinical Implication***

575 Findings from this study provide SLTs with a preliminary description of emergent  
576 literacy skills in Arabic speaking children with DLD. For young children with DLD,  
577 SLTs are often the primary service providers (i.e., providing speech-language therapy  
578 sessions). Therefore, being sensitive to other speech and language related problems that  
579 these children might face later in the future, such as, literacy difficulties, is important.  
580 This knowledge should inform speech and language therapy management and  
581 intervention strategies, in terms of including emergent literacy tasks in assessment and  
582 intervention. Further, findings provide SLTs and teachers with preliminary evidence of

583 the role of oral language skills in emergent literacy (i.e., early reading). This evidence  
584 suggests that deficits in oral language skills might hinder the acquisition of emergent  
585 literacy skills. Teachers should be aware of this and, where oral language difficulties are  
586 identified, refer to SLTs to access appropriate support.

### 587 ***Conclusion***

588 This study contributes to the field's knowledge regarding Arabic speaking children with  
589 DLD. It represents an important first step in understanding early literacy skills and their  
590 relationships to language in Arabic speaking children with and without DLD. Results  
591 demonstrated that language deficits may be related to the acquisition of emergent  
592 literacy skills. Furthermore, findings indicated the potential importance of the  
593 morphosyntactic structure for literacy acquisition in Arabic speaking children. This  
594 study paves the way for future research that investigates the relationship between oral  
595 language and early literacy skills in the Arabic language, which is very relevant for  
596 clinical and education provision the children receive.

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601 language therapists who facilitated recruitment of the children.

602

### 603 **Declaration of interest**

604 The authors report no declarations of interest.

605

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